

6

Collecting Data

Collecting data is a critical part of the investigation. Although initial information is collected by the site readiness team, the detailed information collected by the accident investigation board is the foundation for the entire investigation, including the analyses and conclusions. These in turn become the basis for identifying preventive measures to preclude recurrences. Consequently, it is important to ensure that all relevant information is collected and that the information is accurate.

Collecting evidence can be a lengthy and time-consuming process. Not all information is easy to assemble. Witnesses may have sketchy or conflicting accounts of the accident, physical evidence may be badly damaged or completely destroyed, and documentary evidence may be minimal or difficult to access. Thorough investigation requires that board members be diligent in pursuing evidence and adequately explore leads, lines of inquiry, and potential causal factors.

Gathering and analyzing information is an interdependent process that takes place throughout the first three weeks of the investigation cycle. As preliminary analysis is conducted on the initial evidence, gaps will become apparent, requiring the board to collect additional evidence. Generally, many data collection and analysis iterations occur before the board can be certain that all pertinent evidence has been gathered and analyses are finalized.

Three key types of evidence are collected during the investigation:

- **Human or testamentary evidence** includes witness statements and observations.
- **Physical evidence** is matter related to the accident (e.g., equipment, parts, debris, hardware, and other physical items).
- **Documentary evidence** includes paper and electronic information, such as records, reports, procedures, and documentation.

By the time the board arrives at the accident scene, the site readiness team and possibly local authorities have concluded emergency and initial response activities. Therefore, it is important that the board become familiar with the initial investigative actions conducted by the site readiness team and the local authorities. The briefing by the point of contact is intended to communicate to the accident investigation board all actions taken by the site readiness team and other emergency response personnel; at this time, all evidence the site readiness team has collected, including lists of witnesses, witness statements, and other important documents, are also turned over to the board.

The investigation board expands and builds on results from the site readiness team's initial activities. Therefore, the board chairperson must obtain a timely assessment of what has been done and determine the board's immediate actions. It may be helpful for the

board chairperson to designate one board member to oversee evidence collection.

The process of pursuing evidentiary material involves:

- Locating witnesses
- Interviewing witnesses
- Gathering physical evidence
- Collecting documentary evidence
- Examining organizational concerns, management systems, and line management oversight
- Preserving and controlling evidence.

6.1 Collecting Human Evidence

Human evidence is often the most insightful and also the most fragile. Witness recollection declines rapidly in the first 24 hours following an accident or traumatic event. Therefore, human evidence is generally pursued first and with high intensity. Physical and documentary evidence is gathered and analyzed throughout the investigation and often prompts followup interviews and additional lines of questioning.

6.1.1 Locating Witnesses

The investigation board is responsible for locating potential witnesses as soon as possible after the accident. One responsibility of the site readiness team and other initial responders is to identify witnesses, record initial statements, and provide this information to the investigation board upon their arrival. Prompt arrival by board members and expeditious interviewing of witnesses helps ensure that witness statements are as accurate, detailed, and authentic as possible.

Table 6-1 lists sources that investigators can use to locate witnesses.

Table 6-1. These sources are useful for locating witnesses.

Site readiness team members and emergency response personnel can name the person who provided notification of the incident and those present on their arrival, as well as the most complete list available of witnesses and all involved parties.
Principal witnesses and eyewitnesses are the most intimately involved in the accident and may be able to help develop a list of others directly or indirectly involved in the accident.
First-line supervisors are often the first to arrive at an accident scene and may be able to recall precisely who was present at that time or immediately before the accident. Supervisors can also provide the names and phone numbers of safety representatives, facility designers, and others who may have pertinent information.
Local or state police, firemen, or paramedics, if applicable.
Nurses or doctors at the site first aid center or medical care facility (if applicable).
Staff in nearby facilities (those who may have initially responded to the accident scene; staff at local medical facilities).
News media may have access to witness information and photographs or videos of the post-accident scene.
Maintenance and security personnel may have passed through the facility soon before or just after the accident.

6.1.2 Conducting Interviews

Witness testimony is an important element in determining facts that reveal causal factors. It is best to interview principal witnesses and eyewitnesses first, because they often provide the most useful details regarding what happened. Also, if not questioned promptly, they may forget important details.

TIP

The investigator should first get an overview of the accident and then expand information with careful questioning

6.1.2.1 Preparing for Interviews

Much of the investigation's fact-finding occurs in interviews. Therefore, to elicit the most useful information possible from

interviewees, interviewers must be well prepared and have clear objectives for each interview. Table 6-2 provides guidelines for interview preparation.

People's memories, as well as their willingness to assist an investigative board, can be affected by the way they are questioned. Based on the availability of witnesses, board members' time, and the nature and complexity of the accident, the board chairperson and members must determine what interviewing techniques to employ. Some methods that previous accident investigation boards have found successful are described below.

TIP

A witness interview is not an interrogation. Investigators should convey the sense of a cooperative, informal meeting.

Table 6-2. It is important to prepare for interviews.

Identify all interviewees using the <i>Accident Investigation Preliminary Interview List</i> (provided in Section 4). Record each witness's name, job title, phone, work schedule, and availability for a more detailed interview; take a brief statement of his or her involvement in the accident.
Schedule an interview with each witness using the <i>Accident Investigation Interview Schedule Form</i> (provided at the end of this section). Designate one person to oversee this process. Previous boards have found it useful to make the administrative coordinator responsible for scheduling initial and followup interviews and written statement verifications.
Assign a lead interviewer from the board for each interviewee. Having a lead interviewer can help establish consistency in depth and focus of interviews.
Develop sketches and diagrams to pinpoint locations of witnesses, equipment, etc., based on the initial walkthrough and site readiness team input.
Develop a standardized set of interview questions. Charts may be used to assist in developing questions. The <i>Accident Investigation Interview Form</i> (provided at the end of this section) can aid in recording pertinent data.
Discuss interviewing objectives and plan strategies to ensure that all board members use consistent interviewing methods. To enhance the quality of information obtained, everyone should have some training on correct interviewing techniques.
Determine the appropriate means of documenting interviews (handwritten notes, court reporter, etc.) in light of the circumstances. Experience indicates that a court reporter generally is preferable.

Individual versus Group Interviews.

Depending on the specific circumstances and schedule of an accident investigation, investigators may choose to hold either individual or group interviews. Generally, principal witnesses and eyewitnesses are interviewed individually to gain independent accounts of the event. However, a group interview may be beneficial in situations where a work crew was involved in or witness to an accident. Moreover, time may not permit interviewing every witness individually, and the potential for gaining insightful information from every witness may be small. Sometimes, group interviews can corroborate testimony given by an individual, but not provide additional details. The board should use their collective judgment to determine which technique is appropriate. Advantages and disadvantages of both techniques are listed in Table 6-3. These considerations should be weighed against the circumstances of the accident when determining which technique to use.

Interviewing: Do's and Don'ts. Interviews can be conducted after the board has established the topical areas to be covered in the interview and after the board chairperson

has reviewed with the board the objectives of the interview and strategies for obtaining useful information. This section summarizes what should and should not be done during witness interviews.

Table 6-4 lists actions that promote effective interviews, and Table 6-5 lists actions to avoid while conducting interviews. It is important to create a comfortable atmosphere in which interviewees are not rushed to recall their observations. Interviewees should feel that they are a part of the investigation team and that their input from initial interviews and possible followup interviews will be used to prevent future accidents and not to assign blame. Interviewees should be notified that followup interviews are a normal part of the investigation process and that further interviews do not mean that their initial statements are suspect. Also, they should be encouraged to contact the board whenever they have concerns or additional information. Before each interview, interviewees should be apprised of the Freedom of Information Act and the Privacy Act as they pertain to their statements and identity. The site Freedom of Information Act/Privacy Act specialist can be consulted for further guidance, if necessary.

Table 6-3. Group and individual interviews have different advantages.

	Individual Interviews	Group Interviews
Advantages	<ul style="list-style-type: none"> ■ Obtain independent stories ■ Obtain individual perceptions ■ Establish one-to-one rapport 	<ul style="list-style-type: none"> ■ More time-efficient ■ All interviewees supplement story; may get more complete picture ■ Other people serve as "memory joggers"
Disadvantages	<ul style="list-style-type: none"> ■ More time-consuming ■ May be more difficult to schedule all witnesses 	<ul style="list-style-type: none"> ■ Interviewees will not have independent stories ■ More vocal members of the group will have more say and influence than those who are quiet ■ "Group think" may develop; some individual details may get lost ■ Contradictions in accounts may not be revealed

Table 6-4. Interviewing Do's.

Create a Relaxed Atmosphere
✓ Introduce yourself and shake hands.
✓ Be polite, patient, and friendly.
✓ Treat witnesses with respect.
Prepare the Witness
✓ Describe the investigation's purpose: to prevent accidents and not to assign blame.
✓ Explain that witnesses may be interviewed more than once.
✓ Explain the provisions of the Freedom of Information Act and the Privacy Act.
✓ Stress how important the facts given during the interview are to the investigation.
Record Information
✓ Rely on a court reporter to provide a detailed record of the interview.
✓ Note crucial information immediately in order to ask meaningful followup questions.
Ask Questions
✓ Establish a line of questioning and stay on track during the interview.
✓ Ask the witness to describe the accident in full before asking a structured set of questions.
✓ Let witnesses tell things in their own way; start the interview with a statement such as "Would you please tell me about...?"
✓ Ask several witnesses similar questions to corroborate facts.
✓ Aid the interviewee with reference points; e.g., "How did the lighting compare to the lighting in this room?"
✓ Keep an open mind; ask questions that explore what has already been stated by others in addition to probing for missing information.
✓ Assist witnesses with visual aids, such as photos, drawings, maps, and graphs.
✓ Be an active listener, and give the witness feedback; restate and rephrase key points.
✓ Ask open-ended questions that generally require more than a "yes" or "no" answer.
✓ Observe and note how replies are conveyed (voice inflections, gestures, expressions, etc.).
Close the Interview
✓ End on a positive note; thank the witness for his/her time and effort.
✓ Allow the witness to read the interview transcript and comment if necessary.

Table 6-5. Interviewing Don'ts.

✓ DO NOT rush the witness while he/she is describing the accident or answering questions.
✓ DO NOT judge, display anger, refute, or be hostile toward the witness.
✓ DO NOT suggest answers.
✓ DO NOT threaten, intimidate, or blame the witness.
✓ DO NOT make promises that cannot be kept (for example, with regard to confidentiality).
✓ DO NOT use inflammatory words ("violate," "kill," "lie," "stupid," etc.).
✓ DO NOT omit questions during the interview because you think you already know the answer.
✓ DO NOT ask questions that suggest an answer, such as "Was the odor like rotten eggs?"

Following these guidelines will help ensure that witness statements are provided freely and accurately, subsequently improving the validity of the information obtained.

6.1.2.2 Evaluating the Witness's State of Mind

Occasionally, a witness's state of mind may affect the accuracy or validity of testimony provided. In conducting witness interviews, investigators should consider:

- The amount of time between the accident and the interview. People normally forget 50 to 80 percent of the details in just 24 hours.
- Contact between this witness and others who may have influenced how this witness recalls the events.
- Signs of stress, shock, amnesia, or other trauma resulting from the accident. Details of unpleasant experiences are frequently blanked from one's memory.

Investigators should note whether an interviewee displays any apparent mental or physical distress or unusual behavior; it may have a bearing on the interview results. These observations can be discussed and resolved later with the board.

6.2 Collecting Physical Evidence

TIP

To ensure consistent documentation, control, and security, it may be useful to designate a single board member or the administrative coordinator to be in charge of handling evidence.

Following the leads and preliminary evidence provided by the initial findings of the site readiness team, the board proceeds in gathering, cataloging, and storing physical evidence from all sources as soon as it becomes available. The most obvious

physical evidence related to an accident or accident scene often includes **solids** such as:

- Equipment
- Tools
- Materials
- Hardware
- Plant facilities
- Pre- and post-accident positions of accident-related elements
- Scattered debris
- Patterns, parts, and properties of physical items associated with the accident.

Less obvious but potentially important physical evidence includes **fluids** (liquids and gases). Many DOE facilities use a multitude of fluids, including chemicals, fuels, hydraulic control or actuating fluids, and lubricants. Analyzing such evidence can reveal much about the operability of equipment and other important factors. Care should be taken if there is pathogenic contamination of physical evidence (e.g., blood); such material may require autoclaving or other sterilization. Specialized technicians experienced in fluid sampling should be employed to help the board collect and analyze fluid evidence. If required, expert analysts can be requested to perform tests on the fluids and report results to the board.

Physical evidence should be systematically collected, protected, preserved, evaluated, and recorded to ultimately determine how and why failures occurred and whether use, abuse, misuse, or nonuse was a causal factor. Significant clues are often found in seemingly insignificant spots, such as hinges and supports.

6.2.1 Documenting Physical Evidence

Evidence should be carefully documented at the time it is obtained or identified. The *Accident Investigation Physical Evidence Log Form* (provided at the end of this section)

can help investigators document and track the

collection of physical evidence. Additional means of documenting physical evidence include sketches, maps, photographs, and videotape.

6.2.1.1 Sketching and Mapping Physical Evidence

Sketching and mapping the position of debris, equipment, tools, and injured persons may be initiated by the site readiness team and expanded on by the accident investigation board. Position maps convey a visual representation of the scene immediately after an accident. Because evidence can be removed, destroyed, or moved, sketching and mapping should be conducted after recording initial witness statements. Precise scale plottings of the position of elements can subsequently be examined to develop and test accident causal theories.

The Accident Investigation Site Sketch, Accident Investigation Site Map, Accident Investigation Position Mapping Form, and Accident Investigation Sketch of Physical Evidence Locations and Orientations (provided at the end of this section) are useful for drawing sketches and maps and recording positions of objects.

6.2.1.2 Photographing and Videotaping Physical Evidence

TIP

Photography and videography can be used in a variety of ways to emphasize areas or items of interest and display them for better understanding. These are best performed by specialists, but should be supervised and directed by an investigator.

Photography is a valuable and versatile tool in accident investigation. Photos or videos can identify, record, or preserve physical accident evidence that cannot be effectively conveyed by words or collected by any other means.

Photographic coverage should be detailed and complete, including standard references to help establish distance and perspective.

Videotapes should cover the overall accident scene, as well as specific locations or items of significance. A thorough videotape allows the board to minimize trips to the accident scene. This may be important if the scene is difficult to access or if it presents hazards. The *Accident Investigation Photographic Log Sheet* (provided at the end of this section) can be used to record photograph or videotape subjects, dates, times, and equipment settings and positions.

Good photographic coverage of the accident is essential, even if photographs or video stills will not be used in the investigation report. However, if not taken properly, photographs and videos can easily misrepresent a scene and lead to false conclusions or findings about an accident. Therefore, whenever possible, accident photography and videotaping should be performed by professionals. Photographic techniques that avoid misrepresentation, such as the inclusion of rulers and particular lighting, may be unknown to amateurs but are common knowledge among professional photographers and videographers.

One of the first responsibilities of the board chairperson should be to acquire a technical photographer whose work will assist the board. Five possible sources include:

- In-plant photo lab
- Other DOE or DOE contractor photo labs
- Commercial photographers; industrial, medical, aerial, legal, portrait, and scientific photographers (perhaps the best to assist in accident investigation

are industrial, legal, or scientific photographers)

- A member of the investigation board
- Security personnel.

Even if photos are taken by a skilled photographer, the investigation board should be prepared to direct the photographer in capturing certain important perspectives or parts of the accident scene. Photographs of evidence and of the scene itself should be taken from many angles to illustrate the perspectives of witnesses and injured persons. In addition, board members may wish to take photos for their own reference.

If available, digital photography will facilitate incorporation of the photographs into the investigation report. However, if this is not practical, high-quality 35mm photographs can be scanned for incorporation in the report.

As photos are taken, a log should be completed noting the scene/subject, date, time, direction, and orientation of photos taken, as well as the photographer's name. The *Accident Investigation Photographic Log Sheet* can be used for this purpose. The *Accident Investigation Sketch of Photography Locations and Orientations* (provided at the end of this section) is helpful when reviewing photos and analyzing information.

6.2.2 Inspecting Physical Evidence

Following initial mapping and photographic recording, a systematic inspection of physical evidence can begin. The inspection involves:

- Surveying the involved equipment, vehicles, structures, etc., to ascertain whether there is any indication that component parts were missing or out of place before the accident
- Noting the absence of any parts of guards, controls, or operating indicators (instru-

ments, position indicators, etc.) among the damaged or remaining parts at the scene

- Identifying as soon as possible any equipment or parts that must be cleaned prior to examination or testing and transferring them to a laboratory or to the care of an expert experienced in appropriate testing methodologies
- Noting the routing or movements of records that can later be traced to find missing components
- Preparing a checklist of complex equipment components to help ensure a thorough survey.

These observations should be recorded in notes and photographs so that investigators avoid relying on their memories. Some investigators find a small cassette tape recorder useful in recording general descriptions of appearance and damage; however, the potential failure of a recorder, inadvertent tape erasure, and limitations of verbal description suggest that verbal recorded descriptions should be used in combination with notes, sketches, and photographs.

6.2.3 Removing Physical Evidence

Following the initial inspection of the scene, investigators may need to remove items of physical evidence. To ensure the integrity of evidence for later examination, the extraction of parts must be controlled and methodical. The process may involve simply picking up components or pieces of damaged equipment, removing bolts and fittings, cutting through major structures, or even recovering evidence from beneath piles of debris. Before evidence is removed from the accident scene, it should be carefully packaged and clearly identified. The readiness team or a pre-assembled investigator's kit can provide general-purpose

cardboard tags or adhesive labels for this purpose.

Equipment or parts thought to be defective, damaged, or improperly assembled should be removed from the accident scene for technical examination. The removal should be documented using position maps and photos to display the part in its final, post-accident position and condition. If improper assembly is suspected, investigators should direct that the part or equipment be photographed and otherwise documented as each subassembly is removed.

Items that have been fractured or otherwise damaged should be packaged carefully to preserve surface detail. Delicate parts should be padded and boxed. Both the part and the outside of the package should be labeled. Greasy or dirty parts can be wrapped in foil and placed in polyethylene bags or other nonabsorbent materials for transport to a testing laboratory, command center, or evidence storage facility. If uncertainties arise, subject matter experts can advise the board regarding effective methods for preserving and packaging evidence and specimens that must be transported for testing.

When preparing to remove physical evidence, these guidelines should be followed:

- Normally, extraction should not start until witnesses have been interviewed, since visual reference to the accident site can stimulate one's memory.
- Extraction and removal or movement of parts should not be started until position records (measurements for maps and photographs) have been made.
- Be aware that the accident site may be unsafe due to dangerous materials or weakened structures.
- Locations of removed parts can be marked with orange spray paint or wire-staffed marking flags. The marking flags

- can be annotated to identify the part removed and to allow later measurement.
- Care during extraction and preliminary examination is necessary to avoid defacing or distorting impact marks and fracture surfaces.
 - The board chairperson and investigators should concur on the start of parts extraction work to assure that board members have completed all observations requiring an intact accident site.

6.3 Collecting Documentary Evidence

Documentary evidence can provide important data and should be preserved and secured as methodically as physical evidence. This information might be in the form of paper, photos, videotape, magnetic tape, or electronic media, either at the site or in files at other locations. Examples of documentary evidence are provided in Table 6-6.

Table 6-6. There are many kinds of documentary evidence.

<ul style="list-style-type: none"> ■ Facility description, specifications, as-built drawings, operating and maintenance requirements, environmental studies and impact statements ■ Mission, budget, and schedule constraints and changes ■ Hazard and safety analysis process documentation, including any prior evaluations ■ Policies, standard directives, safety and management manuals, log books, procedures, and job safety analyses or task analyses ■ Established criteria for analyses, procedures, and their review ■ Design, manufacture, purchasing, installation, test, operations, maintenance, repair, and modification records; construction progress photos, which may show features later covered by construction; construction completion reports and operational documentary photography files; decommissioning and disposal plans, procedures, and records (when pertinent) ■ Machine and equipment manufacturers' manuals; other vendor data ■ Maps, drawings, schematics, instrument charts, and system design descriptions ■ Monitoring and tracking systems ■ Relevant training documents for managerial, supervisory, and other personnel ■ Supervisor-conducted training, job instructions, and safety records ■ Work and loss records and failure histories ■ Employee selection, training, certification, transfer, and personal history ■ Employee meetings, records, and other means of communicating management policy and expectations ■ Appraisals and followup action (contractor and DOE), including relevant quality assurance and engineering appraisals ■ Inspections and audits ■ Correspondence, publications, and press releases ■ Personnel and medical files (Note: These should be obtained only for professional evaluation and then returned) ■ Engineering analyses ■ Computer software ■ Organizational structure, charts, and position descriptions ■ Accident investigation reports, recommendations, and corrective actions; accident experience records from similar occurrences.
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Some work/process/system records are retained only for the workday or the week. Once an accident has occurred, the board must work quickly to collect and preserve these records so they can be examined and considered in the analysis.

Accident investigation preplanning should include procedures for identifying records to be

collected, as well as the people responsible for their collection. Because records are usually not located at the scene of the accident, they are often overlooked in the preliminary collection of evidence.

Documents often provide important evidence for identifying causal factors of an accident. This evidence is useful for:

- Thoroughly examining the policies, standards, and specifications that molded the environment in which the accident occurred
- Indicating the attitudes and actions of people involved in the accident
- Revealing evidence that generally is not established in verbal testimony.

Documentary evidence generally can be grouped into four categories:

- Management control documents that communicate management expectations of how, when, where, and by whom work activities are to be performed
- Records that indicate past and present performance and status of the work activities, as well as the people, equipment, and materials involved
- Reports that identify the content and results of special studies, analyses, audits, appraisals, inspections, inquiries, and investigations related to work activities
- Follow-on documentation that describes actions taken in response to the other types of documentation.

Collectively, this evidence gives important clues to possible underlying causes of errors, malfunctions, and failures that led to the accident.

6.4 Examining Organizational Concerns, Management Systems, and Line Management Oversight

Accident investigations must thoroughly examine organizational concerns, management systems, and line management

oversight processes to determine whether deficiencies in these areas contributed to causes of the accident. DOE Order 225.1 requires that the investigation board “examine policies, standards, and requirements that are applicable to the accident being investigated, as well as management and safety systems at Headquarters and Field Offices that could have contributed to or prevented the accident.” Thus, the investigation board should consider the full range of management systems and operational controls that begin at the first-line supervisor level, up to and including organization directors, site managers, and Headquarters personnel, if appropriate. It is important to note that this focus should not be directed toward individuals.

In determining the causes of management system inadequacies and the failure to anticipate and prevent the conditions leading to the accident, investigators should use the safety management template (Appendix D), which lists criteria for each of three guiding principles of safety management established by the Department to assure an effective safety management program. The criteria in the template are the actions or processes necessary to translate the guiding principles into measurable elements.

The principles and the criteria in the template should be considered when deciding who to interview, what questions to ask, what documents to collect, and what facts are pertinent to the investigation. In addition, the template should be considered when analyzing the facts to determine their significance to the direct, contributing, and root causes of the accident.

Tables 6-7, 6-8, and 6-9 show typical questions board members may ask to determine whether the criteria were met or whether management system deficiencies may have contributed to the accident. These are not intended to be exhaustive; board members should develop specific questions for each specific accident. The results of data

gathering using these questions should be used as input to the tools described in Section 7, which are used to analyze the facts and determine causal factors. The analytical tools

can be used to determine whether concerns about management systems have a relation to or are the causes of the accident. The results should be reported appropriately.

Table 6-7. Criteria for Guiding Principle 1 — Line managers are responsible and accountable for safety.

Criterion 1-1: Clear Safety Policies and Goals	
■	Has line management developed effective safety policies and related goals?
■	Do the safety policies reflect Departmental policies and industry standards?
■	Has line management effectively communicated expectations derived from the policies and goals?
■	Did lack of policy or goals affect the direct, contributing, or root causes of the accident?
Criterion 1-2: Defined Responsibilities and Authorities	
■	Has a clear division of responsibility for safety been established and communicated to all levels of the organization?
■	Do line managers have the authority to make and implement decisions regarding safety that are commensurate with their responsibilities?
■	Do line managers exercise their authority effectively to implement responsibilities regarding safety?
■	Do mechanisms exist for line managers to adjudicate disputes between work goals and safety management needs?
■	Did the lack of defined roles, responsibilities, and authorities affect the causes of the accident?
Criterion 1-3: Project and Resource Management Systems	
■	Are management information systems in place to assure that hazards are analyzed and understood by line managers?
■	Was information available regarding similar occurrences that could have or should have prevented the accident?
■	Do line managers assure that appropriate hazard mitigation actions have been identified?
■	Are adequate systems in place to manage safety information?
■	Did project planning mechanisms address environment, safety, and health concerns?
■	Were appropriate resources available to complete the work in a safe manner?
Criterion 1-4: Line Management Accountability for Performance	
■	Are line managers held accountable for the safety performance of their organizations?
■	Is safety performance a part of their personal performance evaluation criteria?
■	Are line managers penalized for inadequate safety performance?
■	Are safety-related matters reviewed, monitored, and audited on a regular basis?
■	Are safety-related deficiencies resolved in a timely manner?
■	Did prior safety-related deficiencies affect the causes of the accident?
■	Were unresolved safety-related deficiencies present that, if corrected, could have or would have prevented the accident?

Table 6-8. Criteria for Guiding Principle 2 — Comprehensive requirements exist, are appropriate, and are executed.

Criterion 2-1: Requirements Management	
■	Does a process exist to ensure that requirements are identified, communicated, and implemented to provide adequate worker safety and health and to protect the public and the environment?
■	Was a lack of requirements identification, communication, or implementation a factor in the direct, contributing, or root causes of the accident?
Criterion 2-2: Hazards Analysis	
■	Are task-related hazards periodically reevaluated when changes in facility status occur?
■	Are hazard mitigation requirements reevaluated and modified whenever changes occur in facility status?
■	Are requirements for hazard mitigation adequate to ensure safety?
■	Is the site in compliance with applicable Federal and state statutes and Department policy and requirements relative to the accident situation?
■	Was lack of hazards requirements identification a factor in the direct, contributing, or root causes of the accident?
Criterion 2-3: Implementation of Requirements	
■	Were requirements for safety adequately implemented to provide protection for workers, the public, and the environment?
■	Did the failure to implement requirements for safety have an impact on the direct, contributing, or root causes of the accident?
■	Do line managers assure that hazard mitigation actions have been implemented?
■	Have procedures been effectively implemented at all levels of the organization?
Criterion 2-4: Assessment Programs	
■	Did line management establish an assessment program to monitor, review, and evaluate adherence to all applicable Departmental requirements and industry standards for safety as they pertain to the accident?
■	Did the assessment program provide for timely corrective actions when non-compliances were discovered?
■	Does management have an effective feedback system so that they know whether the procedures are being implemented?
■	Does management use the feedback system to make improvements in safety when problems are reported?
■	Was the assessment program adequately defined and implemented?
■	Did a lack of definition or implementation of the assessment program have an impact on the direct, contributing, or root causes of the accident?

Table 6-9. Criteria for Guiding Principle 3 — Competence is commensurate with responsibilities.

Criterion 3-1: Staffing and Qualifications
<ul style="list-style-type: none"> ■ Are staffing levels appropriate, considering responsibilities, activities, hazards, and schedules? ■ Have employees been trained to meet the requirements applicable to the accident? ■ Have subcontractors been trained and qualified on job tasks and hazards applicable to the accident? ■ Did vertical and horizontal lines of interface, communication, and support have any impact on the accident? ■ Do managers and supervisors have sufficient authority, staffing, and support to implement assigned responsibilities, analyses, and decisions relative to the accident? ■ Did the level of staffing, training, or competence affect the direct, contributing, or root causes of the accident? ■ Did the qualifications or training of personnel affect the direct, contributing, or root causes of the accident?
Criterion 3-2: Skills, Knowledge, and Competence
<ul style="list-style-type: none"> ■ Were workers and managers who were directly involved in the accident technically competent to perform their jobs? ■ Were the workers who were involved technically capable of recognizing hazards present in the workplace and responding to eliminate or mitigate the hazards? ■ Do management personnel, technical staff members, and individual workers have the necessary levels of education, training, and experience to recognize hazards in the workplace? ■ Did lack of knowledge of hazards affect the direct, contributing, or root causes of the accident?
Criterion 3-3: Worker Participation and Empowerment
<ul style="list-style-type: none"> ■ Are workers and managers empowered to take appropriate actions when hazards are recognized in the workplace? ■ Can workers refuse to work when unsafe conditions exist, without fear of reprisal? ■ Has a process been developed and implemented to allow workers to raise safety issues? ■ Has management established and implemented a safety-conscious culture? ■ Are workers encouraged to participate and become involved in safety management issues? ■ Did a lack of worker participation in raising safety issues impact the direct, contributing, or root causes of the accident?
Criterion 3-4: Training Programs
<ul style="list-style-type: none"> ■ Have training requirements been established for all positions at all levels of the organization? ■ Are the training requirements adequate for those positions related to the accident? ■ Were all training requirements met for those positions related to the accident? ■ Did the performance of those involved in the accident reflect the recorded training? ■ Did lack of training or job performance affect the direct, contributing, or root causes of the accident?

6.5 Preserving and Controlling Evidence

Preserving and controlling evidence are essential to the integrity and credibility of the investigation. Security and custody of evidence are necessary to prevent its alteration or loss and to establish the accuracy and validity of all evidence collected.

The point of contact is responsible for assuring that a chain of custody is established for all evidence removed from the accident scene before the board arrives. The board chairperson is responsible for establishing an evidentiary custody protocol to ensure that all evidence is well documented at the accident scene and carefully controlled when it is removed and stored after the board arrives. Evidence control procedures similar to the following guidelines will help assure that evidence is not adulterated, corrupted, or lost and that subsequent engineering tests, if conducted, and other analytical results are valid.

- Evidence should be photographed and/or videotaped in its original location immediately following the accident, provided it does not interfere with rescue or amelioration activities.
- A log should be maintained stating the location, date, and time that photos and videos are taken. The *Accident Investigation Photographic Log Sheet* can be used for this purpose. Avoid using photographic attachments that digitally record the date and time on the negative because these images become a permanent part of the photo and may obscure evidence or important details in the photo or video. The computerized/printed date on the back of photos provided by film processors should be used in conjunction with, not in lieu of, a photo log, because the date on photos gives the day the film was processed, not the day the photos were taken.
- Board members should prepare and sign an inventory of all evidentiary items collected, including statements regarding:
 - Lists of items removed from the scene
 - Date and time items were removed from the scene
 - Person who removed items from the scene
 - Location where those items will be stored.
- Evidence should be controlled by signature transfer (signatures of the recipient and the person relinquishing custody) and made available only to those who need to examine and use the evidence during the accident investigation. The *Accident Investigation Physical Evidence Log Form* may be used for this purpose.
- Secure storage should be obtained immediately, and access to evidence controlled throughout the investigation.
- Access to the room or suite of offices used by the investigation board should be restricted. No one other than board members, advisors, and support staff should have access to the board's office space; this includes janitorial staff.
- The board chairperson should determine the disposition of evidence at the conclusion of the investigation.

Documentary evidence can easily be overlooked, misplaced, or taken. Documents can be altered, disfigured, misinterpreted, or electronically corrupted. Computer software and disks can be erased by exposure to magnetic fields. As with other evidence collected during the investigation, documentary evidence should be collected, inventoried, controlled, and secured (in locked containers, if necessary).

TIP

Protect all records relating to the accident until investigation activities or analysis of those records determines that they are not relevant to the accident.

KEY POINTS TO REMEMBER

- Gather as much evidence as quickly as possible. It is easier to discount an item later than to try capturing or reconstructing it later.
- Assess initial response activities performed by the site readiness team to determine any gaps or immediate concerns regarding evidence collection.
- Three types of evidence are gathered during accident investigations:
 - **Human or testamentary evidence** (witness statements and observations)
 - **Physical evidence** (matter related to the accident such as equipment, parts, debris, fluids, and other physical items)
 - **Documentary evidence** (paper and electronic information).
- It is important to preserve and control evidence because it is essential to the integrity and credibility of the investigation. Preventing alteration or loss is necessary to ensure the accuracy and validity of the evidence.
- The six major steps in gathering evidence are:
 - Locating witnesses
 - Interviewing witnesses
 - Gathering physical evidence
 - Collecting documentary evidence
 - Examining organizational concerns, management systems, and line management oversight
 - Preserving and controlling evidence.
- Identify witnesses as quickly as possible to obtain witness statements. Sources for locating witnesses include site readiness and emergency response personnel, personnel intimately involved with the accident, eyewitnesses, first line supervisors, police, firefighters, paramedics, nurses or doctors, news media, and maintenance and security personnel.

- Promoting effective interviews includes careful preparation, creating a relaxed atmosphere, preparing the witness for the interview, recording the interview (preferably by using a court reporter to document the interview), asking open-ended questions, and evaluating the witness's state of mind.
- Do not rush witnesses while they are describing the accident; do not be judgmental, hostile, argumentative; do not display anger, suggest answers, threaten, intimidate, or blame the witness; do not make promises of confidentiality, use inflammatory words, ask questions that suggest an answer, or omit questions because you think you know the answer.
- Make position maps of the accident scene, noting the position of all relevant evidence. Use professionals to capture high-quality photographic evidence.
- Mapping and photographing the accident scene are important, because precise visual representations of the accident scene and pinpointing the location of evidence before it is moved are necessary to ensure the board has the means to examine these items subsequently in the investigation, in order to develop and test casual theories.
- Remove evidence carefully, tagging and packaging it to preserve its integrity.
- Before removing evidence from the accident scene, follow these guidelines:
 - If possible, removal should not begin until witnesses have been interviewed
 - Extraction and removal or movement should not be started until the scene and the location of evidence has been documented
 - Exercise caution and be alert for unsafe conditions or weakened structures
 - The location of removed material can be marked with paint or flags
 - Avoid defacing or distorting impact marks and fracture surfaces
 - The board should concur on removal.
- Documentary evidence is generally grouped into four categories:
 - Management control documents
 - Records that indicate past and present status of work activities
 - Reports of studies, analyses, audits, etc.
 - Follow-on documentation that describes actions taken in response to other types of documentation.
- Gather documents and electronic records that could reveal deficiencies in safety systems and management evaluation.
- Consider management systems' role in the accident when collecting and reviewing evidence.
- Apply the guiding principles of safety management and the safety management template to form questions that will guide evidence collection and analysis covering management systems, organizational structure, and line management oversight as possible causes of the accident.
- Establish a chain of custody for evidence and ensure that it is strictly maintained throughout the investigation.

